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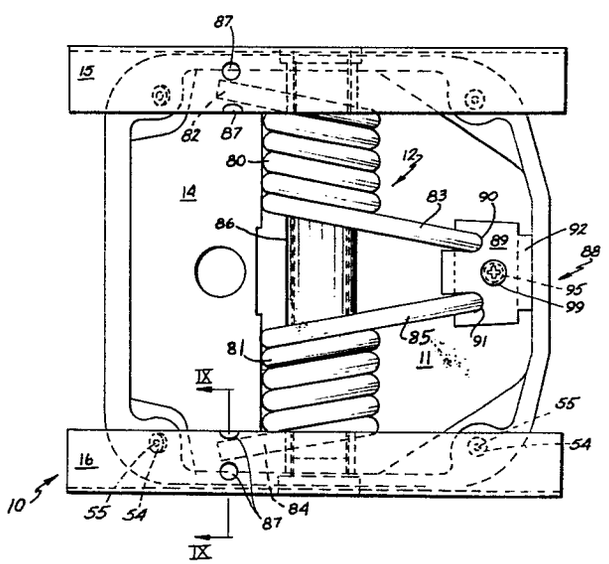
(54) Chair controls.

(57) A chair control employing an open top, generally rectangular, drawn cup (11) for housing an energy storage package (12). An axle (20) secured to and extending between stretchers (15, 16) which are secured to a tilting chair or member thereof, is journalled in the drawn cup and carries the energy storage package. Means (88) for adjusting the preload of the energy package and reducing the likelihood of an energy package failure are provided. First (21) and second (22) interlocking spindle support members are provided which form a cup reinforcing and stress distributing structure roughly box-shaped in cross section. The four outsids corners of the cup are strengthened by indented sidewall portions (60–63). A strengthening flange (56) is disposed about the periphery of the cup and the axle, journalled in the cup, has a relatively large diameter for distributing stress.



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CHAIR CONTROLS

This invention relates generally to chair controls or chair irons for tilting chairs or tilting components of chairs. More particularly, the invention is directed to a chair control achieving simplicity, neatness, compactness, reliability, and cost savings.

In a tilting chair the seat and back are firmly fastened together and the seat is mounted on a base providing pivotable movement. Tilting movement is supplied by a chair control disposed between the base and the chair seat. An energy package in the chair control resists backward tilting of the chair to effectively spring bias the chair to a generally upright position. Other types of chairs employing a chair control have both stationary and tilting chair members. An example of such a chair is a secretarial chair having a chair back mounted for backward tilting movement relative to the seat. In this case the chair control spring biases the chair back into a generally upright position.

In general, these prior art chair controls suffer from a number of common disadvantages. In the prior art, the internal workings of the chair control are in the open and in many cases the stationary and pivoting frame members are relatively complex structures interconnected by a plurality of rivets and bolts. The extra work required, when bolts and rivets are used, for assembly of this type of structure slows the operation and materially adds to the cost of manufacture. Furthermore, the fact that

the internal workings of the chair control, and in particular, the energy package are in the open presents several problems. This type of open design presents a cluttered appearance, presents the possibility of pinching or catching material in the energy package and in general serves as a settling place for debris.

Attempts to at least partially enclose the internal workings of the chair control are found in the prior art. However, these prior art chair controls have always employed cast iron housings or folded enclosures. Cast iron enclosures are heavy and relatively expensive to manufacture, and casting tolerances are not good. Folded enclosures generally enclose no more than three sides of the chair control, and are made of relatively thick metal in order to withstand the relatively high stresses imposed on the chair control. Use of relatively thick metal for the folded enclosure adds to the cost of manufacturing these types of chair controls. Such structures are difficult to fold and weld, and waste much of the sheet material from which they are formed. Also, the tolerances achieved with folded enclosures are still not high, and a relatively complex chair control is presented with many internal workings still exposed.

According to the present invention, a chair control comprises: an open top, generally rectangular, deep drawn cup having five sides for enclosing a torsional energy storage package; means for securing a base structure to the cup and evenly distributing stresses to the walls of the cup, the

securing means comprising first and second generally L-shaped interlocking spindle support members, the support members having apertures for receiving a spindle and the support members forming a roughly box-shaped cup reinforcing structure welded to the bottom and three adjoining sidewalls of the cup; and means for journalling a tilting chair member about the cup, including first and second stretchers for securing the chair control to a tilting chair member.

Another problem with prior art chair controls involves free-fall of the tilting chair member against its stops upon failure of the energy package or an associated component. Often this free-fall backward into the tilted position is violent enough to tip the chair backward and endanger the occupant. A chair control according to the present invention can be made to overcome this problem by including stop means disposed on the top four corners of the cup for defining an arc of travel of a tilting chair member journalled about the cup. The present invention provides a relatively thin drawn metal cup which, by a combination of features, has sufficient strength to withstand the stresses normally imposed on a chair control. These features include the inherent strength and stiffness of a rectangular or box-shaped structure and provision of means for securing a base structure to the housing and evenly distributing stress to the

walls of the housing.

In more narrow aspects of the invention, the means for securing a base structure to the housing and evenly distributing stress to the walls of the housing comprises first and second interlocking spindle support members forming a cup reinforcing structure roughly box-shaped in cross section. This box-shaped spindle securing structure serves to transmit and evenly distribute forces from the stationary chair structure to four of the five walls of the drawn housing. Additionally this structure, because of its box-shape serves to materially strengthen the cup. The means for journalling a tilting chair member about the housing comprises first and second stretchers for securing the chair control to a tilting chair or tilting chair section. An axle is secured to both stretchers and extends therebetween. The axle is journalled in the drawn cup such that the tilting chair member is pivotable about the cup. The energy storage package spring biases the tilting chair member in a generally upright position. A relatively large diameter axle is journalled in the cup, to more evenly distribute the load of the axle on the drawn cup. The four outside corners of the cup are reinforced by indented sidewall portions interconnecting two sides of the cup in each outside corner. The cup is further strengthened by a flange disposed about the periphery of the cup. The flange also serves as a mounting platform for stop means defining the arc of travel of the tilting chair

member.

The invention may be carried into practice in various ways but one chair control embodying the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a top view of the chair control;

Figure 2 is a side view of the chair control;

Figure 3 is a top view of the housing of the chair control;

Figure 4 is a side view, partially in section of the housing of the chair control;

Figure 5 is a rear view of the housing of the chair control;

Figure 6 is a sectional view taken along line VI-VI of Figure 2;

Figure 7 is a detailed view of the end of the axle of the chair control illustrating the manner of its attachment to a stretcher;

Figure 8 is a plan view of an adjustment rod forming part of the chair control; and

Figure 9 is a fractional sectional view of the stretcher taken along line IX-IX of Figures 1 and 2.

Referring to Figures 1 and 2, a chair control or chair iron constructed according to the present invention is illustrated. The chair control generally indicated by the numeral 10 comprises an open top, generally rectangular, drawn cup 11 for housing an energy storage package generally indicated by the numeral 12. Means for securing a base structure to

the cup 11 and evenly distributing stress to the walls of the cup 11 is disposed at 14. First and second stretchers 15 and 16 respectively, are disposed on opposite sides of the cup 11. The stretchers 15 and 16 enable the chair control to be secured to a tilting chair member. An axle 20 is secured to and extends between the stretchers 15 and 16, the axle being journalled in the drawn cup 11.

The present embodiment of the invention is particularly adapted for use as a tilting chair control. In a tilting chair, the seat and back are firmly fastened together and the chair is mounted on a base providing pivotable movement. The chair control 10 is disposed between the base and the chair, providing backward movement and effectively spring biasing the chair in a generally upright position. The means 14 for securing the base to the cup 11 and evenly distributing stress to the walls of the cup includes apertures 21 and 22 for receiving the spindle of a base structure. The stretchers such as the one illustrated at 16 are bolted or otherwise secured in a suitable manner to the underside of the chair seat. The tilting action of the chair results from rotation of the axle 20 journalled in the drawn cup 11. The energy package housed within the drawn cup 11 spring biases the stretchers to the generally horizontal position illustrated by the stretcher 16 in Figure 2. Tilting of the chair backward rotates the stretchers 16

through an arc α illustrated in Figure 2. Pivotable movement about a generally vertical axis is achieved through rotation of a base spindle inserted in apertures 21 and 22 and suitably secured thereto by staking, welding, or the like.

Alternatively, a chair control constructed in accordance with the present invention may be employed with a chair having stationary and tilting chair sections. An example of such a chair is a secretarial chair having a chair back which is mounted for backward tilting movement relative to the seat. In this case, the seat is fixed and forms part of the base structure and the seat back is held in a normal or upright position by the chair control 10. When applying the chair control 10 to a secretarial chair or the like, the rectangular drawn cup 11 is secured to the chair seat by a bolt or the like inserted through the apertures 21 and 22. The tilting chair back is then secured to the stretchers 15 and 16 to allow tilting movement of the chair back through the angle α. The energy package contained in the drawn cup 11 serves to spring bias the stretchers and hence the chair back to a generally upright position.

Many of the advantages that flow from the chair control being described result from provision of an open top, generally rectangular drawn cup for housing the internal workings of the chair control. Referring now to Figures 3, 4 and 5, the drawn cup 11 is illustrated in further detail. Heretofore it has been thought impossible to employ relatively thin metal of

the type used in a drawing process for housing the internal workings, and in particular, the energy package of a chair control because of the relatively high stresses imposed on the structural members of a chair control. The drawn cup 11 is suitably strengthened through a combination of features. To begin with, the overall shape of the cup lends to its strength. A five-sided rectangular structure is inherently stronger and stiffer than three and four-sided, folded structures constructed from the same material. Furthermore the means for securing the base to the cup and evenly distributing stress to the walls of the cup disposed at 14 comprises first and second interlocking spindle support memebrs 30 and 31 which form a cup reinforcing and stress distributing structure roughly box-shaped in cross section. As best illustrated in Figure 3, the box-shaped cup reinforcing structure is welded to opposing sides 32 and 33 of the cup 11 and to a third side 34 and the bottom 35 of the cup 11. The box-shaped structure is in itself inherently stiff and by virtue of its widely distributed four point contact with the cup 11, serves to evenly distribute stresses from the spindle to the relatively thin drawn cup 11. The interlocking spindle support members 30 and 31 included mating tabs and slots at 38, 39 and 40, defining an interface between the support members disposed so that the support members 30 and 31 may be fused together and to the cup 11 with single welds disposed at 41 and 42. This greatly simplifies manufacturing procedures, since the

cup 11 may simply be set in a jig or fixture having a spindle which protrudes through the opening 43 in the bottom of the cup. The interlocking spindle support members 30 and 31 may then be dropped over the spindle and secured there by gravity while welds 41 and 42 are applied. Welds at 43 and 44 secure the box-shaped reinforcing structure to opposing sides 32 and 33, respectively, of the drawn cup 11. Another advantage provided by the drawn cup is that the drawn cup can be easily manufactured to higher tolerances than folded structures.

The drawn cup 11 further includes means for journalling a tilting chair member about the cup, the means comprising a pair of apertures 45 and 46 disposed in opposing sides 32 and 33, respectively, of the drawn cup 11. The apertures 45 and 46 receive the relatively large diameter axle 20 (best illustrated in Figure 1) which contributes to the feasibility of the drawn cup design by serving to evenly distribute stresses transmitted to the cup from the tilting chair member. The diameter of the axle 20 is approximately 2.5 cms, or larger.

The cup 11 further includes stop means disposed on the top four corners of the cup in apertures 50, 51, 52 and 53 (best illustrated in Figure 3) for defining the arc of travel. The stop means fitted into these apertures comprises a plurality of plastic buttons 54 best illustrated in Figures 1 and 2. Preferably the buttons 54 are formed of a urethane elastomer and include a centrally located projection

55. The buttons 54 prevent metal-to-metal contact between the stretchers 15 and 16 and the cup 11. The projections 55 provide a further cushioning effect to provide a stop action which is initially soft but quickly firms. The buttons 54 are mounted on a flange 56 which extends about the periphery of the cup. In addition to providing a convenient mounting platform for the stop means, the flange 56 serves additionally to strengthen the cup and aids in tooling considerations. The four top corners of the cup in which the apertures 50-53 are provided are further strengthened by indented sidewall portions 60, 61, 62 and 63 which each interconnect two sides of the cup below each of the top four corners of the cup. For example, the indented sidewall portion 60 disposed below the aperture 50 interconnects the sidewalls 33 and 34 of the cup 11.

Referring now to Figures 6 and 7, details regarding the journalling of the axle 20 in the cup 11 and the securing of the axle 20 to the stretchers 15 and 16 are further illustrated. The axle 20 is journalled in the drawn cup 11 with plastic bearing inserts such as the one illustrated at 70. The plastic bearing inserts are simply pressed into the cup 11 and mainly receive radial loading from the axle 20. However, the bearing inserts 70 also include thrust bearing faces 71 that face away from the cup 11 to maintain appropriate spacing between the cup 11 and the stretchers 15 and 16. Spacing between the cup 11 and the stretchers 15 and 16 sufficient to ensure clearance

for the flange 56 extending about the periphery of the cup is ensured by inwardly projecting embossed sections 72 on the stretchers 15 and 16. The inwardly embossed sections 72 are disposed on the stretchers 15 and 16 at the point at which they are secured to the axle 20, such that the thrust bearing faces 71 of the bearings 70 ride thereagainst. The embossed sections 72 reduce the thickness required for the bearing inserts 70 and thus reduce the cost of the inserts.

The ends of the axle 20 are slotted as illustrated at 74 and the stretchers 15 and 16 are provided with webbed openings 75 through which the ends of the axle project. Each webbed opening 75 includes a web 76 which is aligned with the slot 74 provided on the respective end of axle 20. The axle 20 is conviently secured to the stretchers 15 and 16 by swagging or expanding the ends of the axle as illustrated at 77. The swagged ends 77 of the axle 20 are surrounded by inwardly embossed section 72 of stretchers 15 and 16, and this serves conveniently to reduce the possibility of snagging fabric or scratching the occupant of the chair.

Referring now back to Figures 1 and 2, the energy package 12 housed within the drawn cup 11 will be described in further detail. The energy package 12 may be characterized as being of the torsion coil spring type although it should be understood that with minor modifications other types of energy packages may be employed. For example, known types of energy packages that may be used with the present invention include

rubber pack, coil spring, leaf spring, and torsion bar systems for storing energy. Rubber packs comprise a stationary support member and a tilting member interconnected by a web of resilient rubber. Coil spring systems may be of the torsion spring type or simple compression and tension type. Torsion coil springs may have the coil fixed with one or two tails of the coil deflected, or both tails of the coil may be fixed and the coil itself may be deflected. With simple coil spring systems, energy is stored by simple compression or extension of a coil spring. Leaf spring systems include cantilever and beam loaded energy storing members. Torsion bar systems may be fixed at one end with a moment applied to the opposite end or maybe fixed at both ends with a moment applied to the centre of the torsion bar.

In the preferred embodiment shown in the drawings, two coil spring 80 and 81 are provided. Coil spring 80 includes tails 82 and 83 and coil spring 81 includes tails 84 and 85. The coil springs 80 and 81 are carried by the axle 20 which fixes the position of the coils in the drawn cup 11 and prevents eccentric deflection of the coil springs when torsionally loaded. A protective plastic sleeve 86 is disposed between the axle 20 and the springs 80 and 81. The plastic sleeve 86 prevents metal to metal contact between the springs and the axle, improving the feel and sound of the chair control as well as lengthening the life of the springs. Tails 82 and 84 of the coil springs 80 and 81 rest under the strecthers 15 and 16, respectively,

and are provided with a sufficient torsional preload to urge the stretchers 15 and 16 to the generally horizontal position illustrated by the stretcher 16 in Figure 2. As best illustrated in Figures 1 and 9, the stretchers 15 and 16 include spring locators 87 formed integrally with the stretchers at a significant manufacturing and cost advantage. The spring locators 87 are stamped, punched or otherwise suitably formed in the stretchers and the spring tails 82 and 84 are retained therebetween in the area generally indicated at 87'. The tails 83 and 85 on the opposite ends of the coils 80 and 81 respectively, are caught by means for adjusting the preload of the coils 80 and 81, generally indicated at 88.

The means for adjusting the preload of the energy package comprises a bracket 89, including notches 90 and 91 through which the tails 83 and 85 of the coil springs 80 and 81 project, resting under the bracket 89. The bracket 89 is vertically adjustable to vary the preload of the springs 80 and 81. The bracket 89 includes a flange 92 which slides along a vertical wall 93 of the drawn cup 11 to guide vertical movement of the bracket 89. A threaded adjustment rod or bolt 94 (best illustrated in Figure 8) engages a threaded aperture 95 in the bracket 89. The bottom of the drawn cup 11 includes an aperture 96 best illustrated in Figure 3. The threaded adjustment rod includes a handle 97 including a first circumferential shoulder 98. The threaded adjustment rod 94 is inserted through the aperture 96 in the drawn cup 11 and

threadably engages the bracket 89 to vertically adjust the bracket 89 within the drawn cup 11 by rotation of the handle 97. A retaining screw 99 is threadably received in an axially extending aperture 99' disposed on the end of the adjustment rod 94. The retaining screw 99 prevents the bracket 89 from becoming separated from the adjustment rod 99 at the minimum preload adjustment.

Provision of dual coil springs 80 and 81 in combination with the means for adjusting the preload of the coil springs generally indicated at 88 provides an added safety factor in the case of energy package failure. For example, if one of the two coil springs 80 and 81 were to fail, the bracket 89, although eccentrically loaded would still be sufficiently supported by the threaded asjustment rod 94 and guided by the rearwall 93 to ensure that the tail of the remaining coil spring would remain under the bracket 89, preventing a complete energy package failure.

Referring now specifically to Figure 8, the threaded adjustment rod 94 is illustrated in further detail. The handle 97 and first circumferential shoulder 98 of the threaded adjustment rod 94 are made of plastic,or the like, cast on the threaded rod 94. This is the conventional manner of constructing threaded adjustment rods. However, with conventional adjustment rods, upon failure of the plastic handle 97, the first circumferential shoulder 98 disintagrates, releasing the adjustment rod and causing a total energy package failure. In the prior art, this provides a potentially dangerous situation, since

upon energy package failure, the chair will free-fall through the angle α, against its rear stops. Since the angle α is normally about 18 or 20 degrees, often this free-fall is sufficient to overturn the chair and endanger the occupant. However, in the construction shown in the drawings, the threaded rod 94 includes means for reducing the likelihood of energy package failure comprising a second circumferential shoulder 100 disposed on the threaded rod 94. The second circumferential shoulder 100 is formed from the base metal of the threaded adjustment rod 94 and is disposed on the adjustment rod outside the drawn cup 11 and the first circumferential shoulder 98. Thus, upon failure of the plastic handle 97, which causes disintegration of the first circumferential shoulder 98, the second circumferential shoulder 100 acts as a backup, preventing release of the threaded adjustment rod 94. Since the first and second circumferential shoulders 98 and 100 are disposed in close proximity on the threaded adjustment rod 94, upon failure of the plastic handle 97, a free-fall of approximately three degrees will occur. Thus, the second shoulder 100 allows the use of a simple moulded or cast plastic first shoulder and handle, decreasing the cost of the chair control and yet substantially reducing the probability of an energy package failure that could endanger the occupant upon failure of the plastic handle and first shoulder.

CLAIMS

1. A chair control comprising: an open top, generally rectangular, deep drawn cup (11) having five sides for enclosing a torsional energy storage package (12); means (14) for securing a base structure to the cup and evenly distributing stresses to the walls of the cup, the securing means comprising first (30) and second (31) generally L-shaped interlocking spindle support members, the support members having apertures (21, 22) for receiving a spindle and the support members forming a roughly box-shaped cup reinforcing structure welded to the bottom (35) and three adjoining sidewalls (32, 33, 34) of the cup; and means for journalling a tilting chair member about the cup, including first (15) and second (16) stretchers for securing the chair control to a tilting chair member.

2. A chair control according to Claim 1 characterised by stop means disposed on the top four corners of the cup for defining an arc of travel of a tilting chair member journalled about the cup.

3. A chair control according to Claim 2 characterised in that the stop means comprise a plurality of elastomer buttons (54), each elastomer button including an integrally formed projection (55) for improving the feel of the stop means.

4. A chair control according to Claim 2 or Claim 3 characterised by means for strengthening the top four corners of the cup comprising an indented sidewall portion (60 - 63) interconnecting two sides of the cup below each of the four corners of the cup.

5. A chair control according to Claim 4 characterised by a flange (56) disposed about the periphery of the cup, the flange strengthening the cup and providing a mounting platform for the stop means in each of the top four corners of the cup.

6. A chair control according to any of Claims 1 to 5 characterised in that the first and second interlocking spindle support members are provided with an interface between the support members disposed so that the support members are fused together and to the cup with a single weld (42).

7. A chair control according to any of Claims 1 to 6 characterised in that the means for journalling a tilting chair member about the cup further comprises; a relatively large axle (20) for distributing stress from the chair to the cup, the axle being secured to and extending between the stretchers and the axle being journalled in opposing sidewalls of the drawn cup.

8. A chair control according to Claim 7 characterised in that the axle has a diameter of at least 25 mm to evenly distribute stress from the chair to the walls of the drawn cup.

9. A chair control according to Claim 7 or Claim 8 characterised in that the first and second stretchers are embossed at the points (72) at which the axle is secured thereto to provide clearance for the said flange.

10. A chair control according to Claim 7 or Claim 8 or Claim 9 characterised in that the ends of the axle are slotted (74) and the first and second stretchers are provided with webbed openings (75) through which the ends of the axle project, the axle being secured to the first and second stretchers by swagging the ends (77) of the axle.

11. A chair control according to any of Claims 1 to 10 characterised by means for adjusting the preload of an energy package and reducing the likelihood of an energy package failure.

12. A chair control according to any of Claims 1 to 11 which includes an energy package characterised in that the energy package comprises a pair of torsionally loaded coil springs (80, 81) encompassing the axle and each including first (82, 84) and second (83, 85) tails, the first tails resting under the first and second stretchers and the second tails being secured to the cup.

13. A chair control according to Claim 12 characterised by a plastic sleeve (86) disposed between the coil springs and the axle for improving the feel of the chair control and reducing wear from metal-to-metal contact between the springs and the axle.

14. A chair control according to Claim 12 or Claim 13 characterised in that the stretchers include integrally formed spring locators (87) comprising a pair of projections disposed on each stretcher, the first tails being centred therebetween.

15. A chair control according to Claim 12 or Claim 13 or Claim 14 characterised by means (88) for adjusting the preload of the energy package comprising: a bracket (89) for catching the second tails and including a threaded bracket aperture (95); a threaded adjustment rod (94) engaging the bracket aperture; a cup aperture (96) disposed in the cup, the adjustment rod extending therethrough; a circumferential shoulder (98) disposed on the adjustment rod outside the cup; and means (97) for turning the adjustment rod to vary the preload of the energy package.

16. A chair control according to Claim 15 characterised by means for reducing the likelihood of an energy package failure comprising a second circumferential shoulder (100) disposed on the

adjustment rod outside the cup and outside the first circumferential shoulder.

17. A chair control according to Claim 11 characterised in that the means for adjusting the preload of an energy package and reducing the likelihood of energy package failure comprises: a threaded bracket (89) engaging an energy package for varying the preload of an energy package; a threaded adjustment rod (94) engaging the bracket for varying the position of the bracket and thus varying the preload of an energy package; a plastic handle (97) for facilitating rotation of the adjustment rod and for varying the position of the bracket with respect to an energy package structural support; a first shoulder (98) defined by the plastic handle for fixing the position of the adjustment rod with respect to an energy package housing; and a second metal shoulder (100) defined by the adjustment rod, the plastic handle being cast therearound, the second metal shoulder serving to fix the position of the adjustment rod with respect to an energy package housing upon failure of the plastic handle, the second metal shoulder thereby preventing an energy package failure upon failure of the plastic handle.

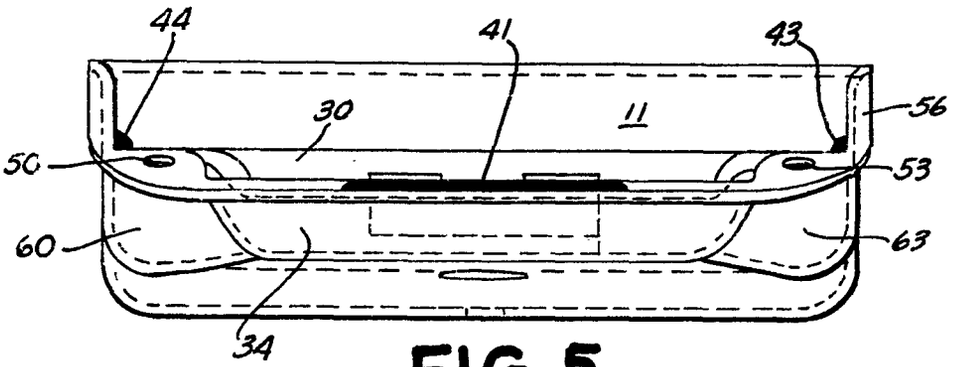
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FIG. 5.

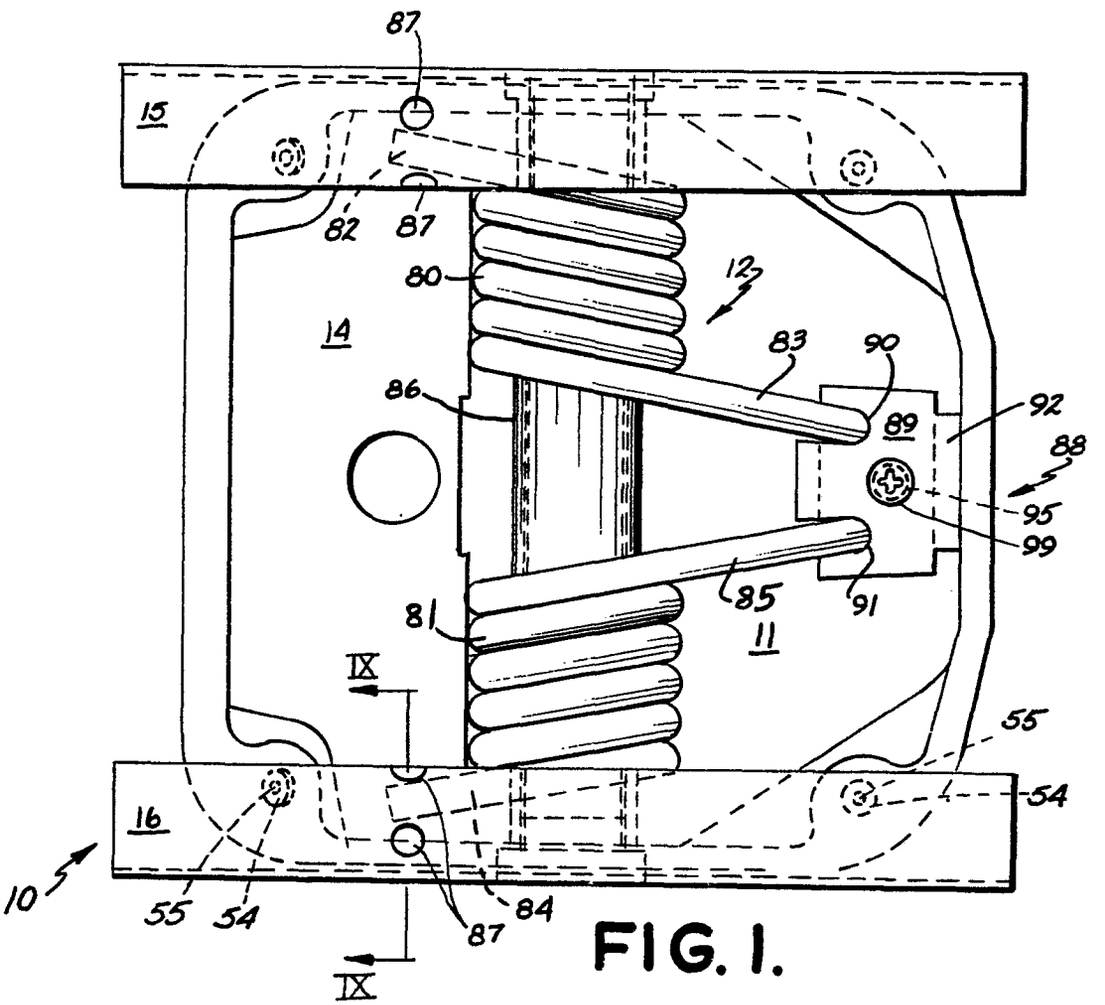
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FIG. 1.

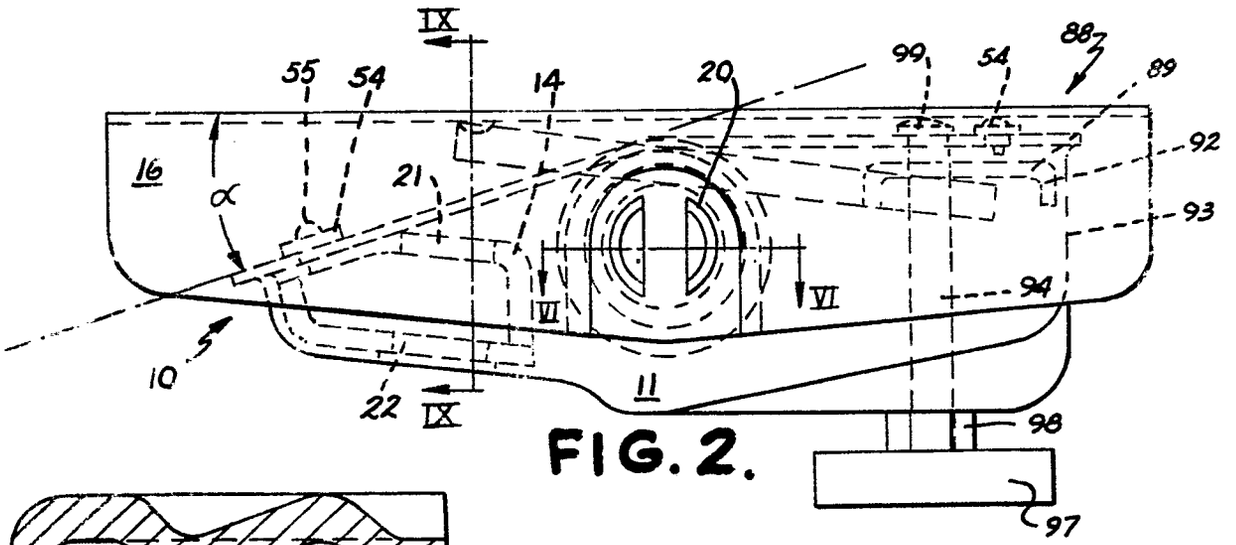

FIG. 2.

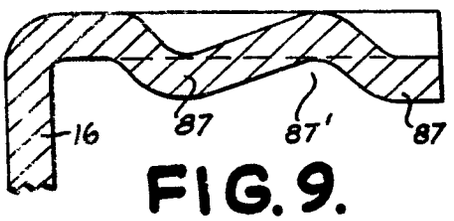

FIG. 9.

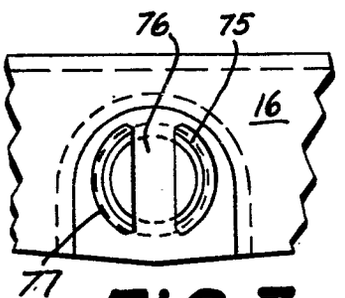

FIG. 7.

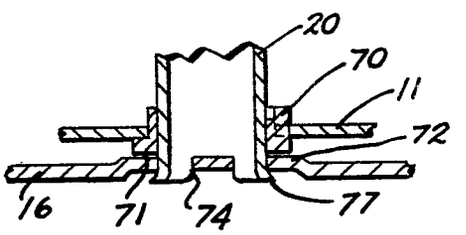

FIG. 6.

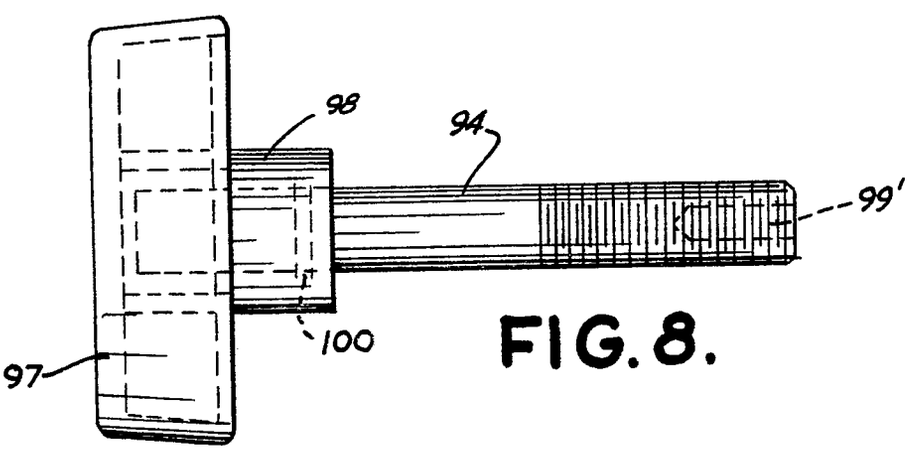

FIG. 8.

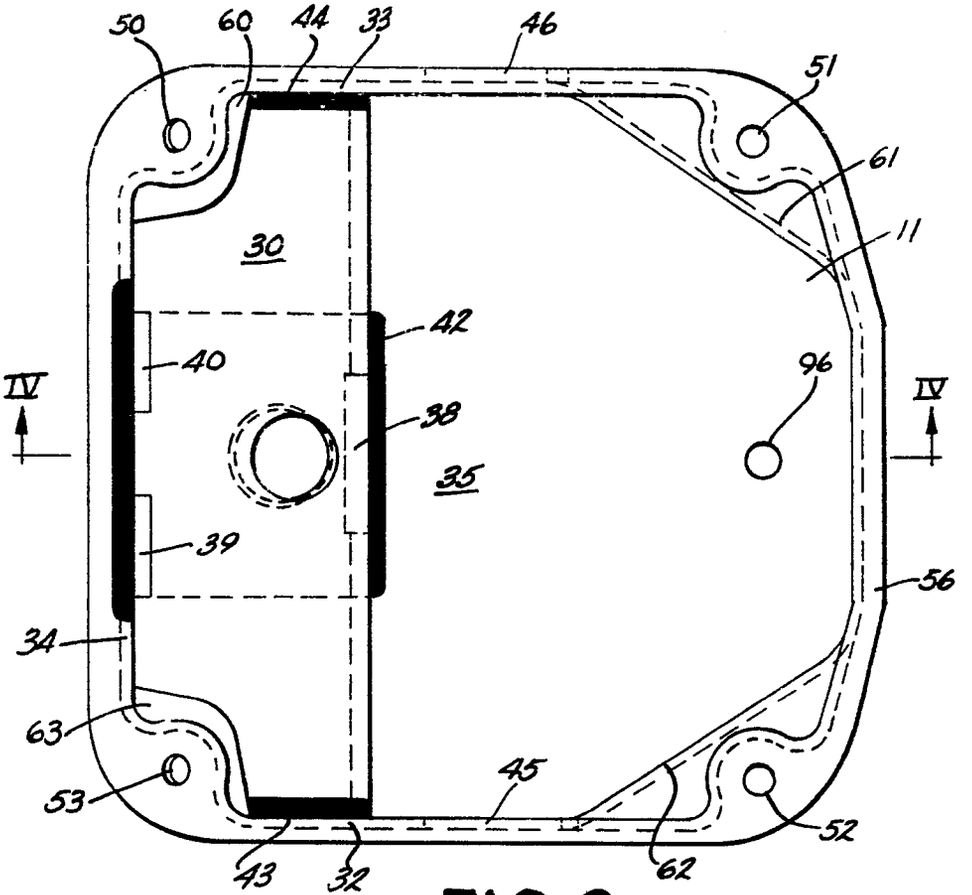
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FIG. 3.

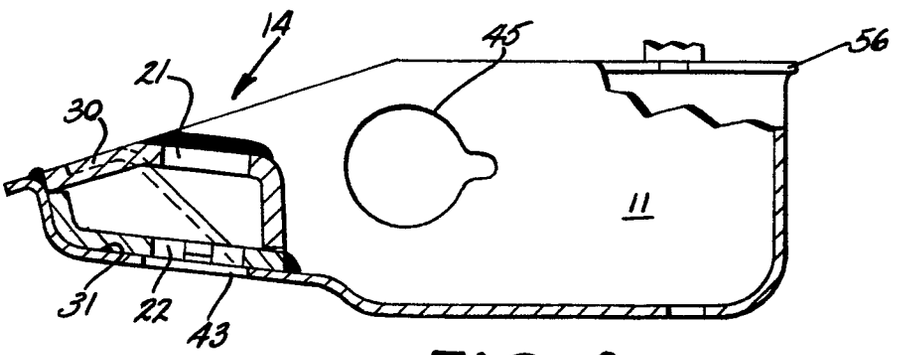
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FIG. 4.

European Patent Office

EUROPEAN SEARCH REPORT

0010990
Application number
EP 79 30 2477

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
	GB - A - 998 568 (THE SENG COMPANY) * Page 2, line 23 - page 3, line 2; figures * --	1,7,11
	US - A - 3 758 157 (FRIES) * Column 4, lines 16-19, 52-62; figures 4,8,10 * --	1,11
	FR - A - 2 181 415 (STEBLCASE) * Page 4, lines 7-29; page 4, line 34 - page 5, line 31; figures * ----	1,2,11

CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

A 47 C 3/026

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

A 47 C

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30-01-1980	VANDEVONDELE

EPO Form 1503.1 06.78